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09/830,645	12/03/2001	Kazunori Fukada	FUKADA1	1868

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EXAMINER	
WILKINS III, HARRY D	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 02/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/830,645	FUKADA, KAZUNORI	
	Examiner	Art Unit	
	Harry D Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11 and 13* is/are rejected.

7)☒ Claim(s) *1 and 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 19 December 2003 has been entered.

Claim Interpretation

2. The new limitation "having a complex shape" will be interpreted to mean a shape such as a rotor, cylinder or cylinder cover as claimed.

Claim Objections

3. Claim 1 is objected to because of the following informalities: in the last clause, "a front cylinder, and a rear cylinder" should be corrected to recite "a front cylinder *cover*, and a rear cylinder *cover*" as is supported by the specification. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Applicant's admission of prior art in view of Kojima et al (JP 55-041940) and "Plasma (Ion) Nitriding".

Applicant admits as prior art (see pages 1-3) that air motors have been made having rotors, cylinders and front and rear cylinder covers. These parts have a complex shape as claimed. There has been a problem of wear of the surface of these members, which surround the vanes. Thus, there was a need for vane-surrounding members for air motors excellent in abrasion resistance.

Applicant's admission of prior art fails to teach the claimed method of imparting the abrasion resistance, i.e.-the nitrosulphurization process.

Kojima et al teach (see pages 3-4 of English translation) a method of nitrosulphurizing a steel member by exposing the member to glow discharge at 400-600°C in an atmosphere of H_2S, NH_3 and at least one of Ar, He and H_2. Kojima et al teach (see English abstract) that the atmosphere contains 25-100 vol% of NH_3, 0.01-5 vol% H_2S and the rest being H_2. Thus, Kojima et al teach an overlapping range of composition for the gas atmosphere, except that Kojima et al teaches NH_3 and the present claims recite N_2. See MPEP 2144.05 I. Kojima et al teach (see last paragraph on page 7 of English translation) that the method occurs at a pressure of 10^{-1} Torr or less. Kojima et al teach (see paragraph spanning pages 3 and 4 of English translation) that the thickness of the formed surface layer is 3-50 μm.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the nitrosulphurizing treatment of Kojima et al to the conventional air motor

members because the process imparts superior abrasion resistance and self-lubricity to the members.

"Plasma (Ion) Nitriding" teaches the general state of the art of plasma nitriding. Particularly (see page 421, paragraph spanning 1st and 2nd columns) that nitrogen gas is typically used instead of ammonia because nitrogen gas allows for more precise control of the process and the composition of the nitrided case. "Plasma (Ion) Nitriding" teaches (see page 421, 3rd column) that the typical temperature of plasma nitriding is 375-650°C. "Plasma (Ion) Nitriding" teaches (see page 422, paragraph spanning 1st and 2nd columns) that the voltage utilized in plasma nitriding is from 200-1000V. "Plasma (Ion) Nitriding" teaches (see 1st paragraph) that plasma nitriding (and thus, plasma nitrosulphurizing) produces a uniform case (surface layer). "Plasma (Ion) Nitriding" teach (see Figure 8) that the surface hardness of nitridied steels is 800-1200 Vickers.

Therefore, it would have been obvious to one of ordinary skill in the art to have substituted nitrogen gas (N_2) for the ammonia (NH_3) taught by Kojima et al because "Plasma (Ion) Nitriding" teaches that the nitrogen gas provides more precise control of the process and composition of the nitrided case. Because in ion nitriding and ion nitrosulphurizing, the method works by dissociating the individual gas molecules into their respective atoms, one of ordinary skill in the art would have had a reasonable expectation of successfully applying the N_2 gas to the nitrosulphurizing method of Kojima et al because the source of the N ions for ion nitriding/nitrosulphurizing would not affect the final product. Regarding the hardness of the surface, one of ordinary skill

in the art would have expected the nitrosulphurized surface to have the hardness as claimed because the prior art teaches applying an identical nitrosulphurization treatment to an identical substrate (SCM21).

Regarding the parameter of temperature, it would have been within the expected skill of a routineer in the art to have optimized this value within the disclosed range in order to achieve the best glow-discharge thickness (for support, see "Plasma (Ion) Nitriding" at page 422, paragraph spanning 1st and 2nd columns). Regarding the parameter of DC voltage, it would have been within the expected skill of a routineer in the art to have selected an appropriate voltage to operate at in order to achieve the best glow-discharge thickness (for support, see "Plasma (Ion) Nitriding" at page 422, paragraph spanning 1st and 2nd columns). Changes in temperature, concentrations, or other process conditions of an old process does not impart patentability unless the recited ranges are critical, i.e., they produce a new and unexpected result. In re Aller et al (CCPA 1955) 220 F2d 454, 105 USPQ 233. Only result-effective variables can be optimized. In re Antonie 559 F2d 618, 195 USPQ 6 (CCPA 1977). See MPEP 2144.05 II.

Regarding claim 2, one of ordinary skill in the art would have expected the plasma nitriding of the prior art to have produced a surface hardness of about 1100Vickers because the prior art teaches applying an identical nitrosulphurization treatment to an identical substrate (SCM21).

Regarding claims 3 and 5, Kojima et al teach using a ratio of 5 parts of H_2S to 45 parts of the nitrogen-containing gas (NH_3) (i.e.-when H_2 is 50 vol%, H_2S is 5 vol%,

leaving 45 vol% for NH_3). This is a ratio of 11.1 parts by volume H_2S based on 100 parts by volume of the nitrogen-containing gas. Therefore, it would have been obvious to one of ordinary skill in the art to have maintained the H_2S to nitrogen-containing gas ratio in order to maintain the qualities imparted by the method of Kojima et al when the nitrogen-containing gas was changed to N_2 as per "Plasma (Ion) Nitriding".

Regarding claim 4, Applicant's admission defines the parts that require the improved abrasion resistance as (see page 2, lines 6-12) the vane-surrounding members. The vane-surrounding members are defined (see page 1, lines 2-6) as being the rotor, cylinder and front and rear cylinder covers. It would have been within the expected skill of a routineer in the art to have applied the nitrosulphurization treatment to all of the surfaces subjected to abrasion for the purpose of improving abrasion resistance.

Regarding claim 6, Kojima et al teach (see middle paragraph on page 6 of English translation) using as the base material SCM21 steel. SCM21 steel (now know as SCM415, see "JIS G 4105-1979") was known to be a quench and temper steel (see Takemura et al at col. 10, lines 7-9).

Regarding claim 7, Kojima et al teach (see last paragraph on page 7 of English translation) a broad range for pressure of less than 10^{-1} Torr. "Plasma (Ion) Nitriding" teaches (see paragraph spanning 1st and 2nd cols. on page 422) that pressure affects the nitriding, thus, it would have been within the expected skill of a routineer in the art to have optimized the pressure to achieve the desired ion nitrosulphurizing.

Regarding claim 8, Kojima et al teach (see middle paragraph on page 6 of English translation) nitrosulphurizing for 2 hours.

Regarding claim 9, Kojima et al teach (see page 7 of English translation) that H_2 is suggested as the diluting gas. Kojima et al further teach (see claims 5 and 6) that the H_2S gas is present at 0.01-5 vol% and the NH_3 at 25-100 vol%. Thus, the H_2 content would be up to 75 vol%. While there is no specific example in Kojima et al describing the ratio of N_2 to H_2, it was known in the prior art (see "Plasma (Ion) Nitriding" at page 423, 1st col.) that the ratio of N to H controls what type of nitride surface layer is formed. Therefore, it would have been within the expected skill of a routineer in the art to have optimized the ratio of N_2 to H_2 to form a suitable surface layer.

Regarding claim 10, Kojima et al teach (see page 7 of English translation) adding one or both of Ar and He in addition to H_2 as the diluting gas.

Regarding claim 11, first, as a matter of interpretation, the recitation "partial pressure" in this claim appears to be equivalent to volume percent and examination will be treated as such. To be a partial pressure, the recitation should include an actual pressure. In addition, relative partial pressures are directly proportional to volume percents. As above, it would have been within the expected skill of a routineer in the art to have optimized the applied voltage in order to achieve the best glow-discharge thickness (for support, see "Plasma (Ion) Nitriding" at page 422, paragraph spanning 1st and 2nd columns). Kojima et al fails to meet the presently claimed atmospheric composition range, by teaching 0.01-5 vol% H_2S, 25-100 vol% NH_3 and less than 75 vol% H_2. However, when the N:H ratio (a known result effective variable as described

above) is converted for using N_2 instead of NH_3, the presently claimed composition is within the range of Kojima et al (80 H_2, 5 H_2S and 15 N_2 would be equivalent to 51.153 H_2, 43.846 NH_3 and 5 H_2S). Therefore, it would have been within the expected skill of a routineer in the art to have optimized the composition of the treatment atmosphere to achieve the best surface layer conditions possible.

6. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admission of prior art in view of Kojima et al (JP 55-041940) and "Plasma (Ion) Nitriding" as applied above to claims 1-11 and further in view of Kramer et al (US 3,767,335).

As discussed above in paragraph no. 5, Applicant's admission of prior art in view of Kojima et al and "Plasma (Ion) Nitriding" disclose the invention substantially as claimed.

However, Applicant's admission of prior art does not expressly disclose the air motor as claimed.

Kramer et al teach (see figure 1 and col. 2, lines 3-20) an air motor with a rotor supported by bearings and surrounded by a cylinder with a partial annular space as claimed. Though there is no express disclosure of front and back covers, such would exist to close the motor to allow for operation. Also, while there is no express disclosure of means for feeding and exhausting air from the "space", such would exist to allow for operation of the air motor.

Therefore, it would have been obvious to have applied the method of Kojima et al in view of "Plasma (Ion) Nitriding" to the inner surface of the cylinder of Kramer et al because the nitrosulphurizing improves the wear resistance of the surface.

Allowable Subject Matter

7. Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: the closest prior art, Kojima et al, teaches limiting the nitrosulphurization layer to 3-50 μm and specifically to limit the maximum thickness to achieve the improved abrasion resistance. Therefore, it would not have been obvious to one of ordinary skill in the art to have increased the thickness of the nitrosulphurization layer to 140 μm (0.14 mm) as claimed because Kojima et al expressly teaches away from increasing the thickness beyond 50 μm.

Response to Arguments

9. Applicant's arguments filed 19 December 2003 have been fully considered but they are not persuasive. Applicant argued that:

a. There was no recognition of the problem in the field of air motors,

In response, this appears to be directly contrary to Applicant's disclosure, particularly in the paragraph spanning pages 1 and 2, where it is indicated that prior art air motors had problems with abrasion, and is further supported that the prior art had developed methods (by nitriding) to overcome this problem, although not as

successfully as the present invention. Thus, in the Examiner's opinion, it is clear on the record that the recognition of the problem existed in the prior art.

b. Kojima et al is only related to processing a metal sheet, not a "complex shape",

In response, while Kojima et al is directed to treating a steel sheet, one of ordinary skill in the art would have looked to similar prior art methods, particularly the plasma nitriding of "Plasma (Ion) Nitriding", which shows (see paragraph spanning 1st and 2nd cols. on page 424) that plasma nitriding has been used to treat complex shapes, such as gears, crankshafts, cylinder liners and pistons. Thus, one of ordinary skill in the would have expected that the nitrosulphurization process would have acted similarly and been perfectly acceptable for use on complex shapes.

c. Kojima et al do not teach "uniform" nitrosulphurized surface layer,

In response, while Kojima et al are silent as to whether the surface layer is of uniform thickness, "Plasma (Ion) Nitriding" teaches (see 1st paragraph) that plasma nitriding was capable of forming a uniform case (surface layer). Thus, one of ordinary skill in the art would have expected that the nitrosulphurization process would have acted similarly and produced a uniform surface layer.

d. The 2nd paragraph on page 4 of the Final Rejection (mail date 22 July 2003) essentially admits that portions of the claim are not shown or taught by the prior art and in effect "features not provided by the proposed combination would still have been obvious without any prior art",

In response, the Final Rejection makes no assertion of the sort. The paragraph mentioned by Applicant appears above in an identical form as it appeared in the Final Rejection. The contents of that paragraph discuss the fact that specific ranges of temperature and DC voltage parameters taught by the prior art are broader than the range of the present claims, and that it would have been obvious to one of ordinary skill in the art to have optimized the parameters within the broad ranges for known purposes. Please see MPEP 2144.05.II. The basis for the rejection lies in the prior art and the skill of a routineer in the art.

e. Any reliance on inherency is wrong because the references applied have no relationship to the field of air motors and thus were not "reasonably certain" or "inevitable",

In response,

"Where the claimed and prior art products are identical or substantially identical in structure or composition or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established, In re Best 195 USPQ 430, 433 (CCPA 1977). 'When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing they are not.' In re Spada, 15 USPQ2d 1655, 168 (Fed. Cir. 1990). Therefore, the prima facie case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed product. In re Best 195 USPQ 430, 433 (CCPA 1977)." See MPEP 2112.01.

The prior art method includes treating an identical steel composition (SCM21/SCM415) by an identical method (nitrosulphurization). Thus, the basis for any inherency comes from the fact that if you treat a identical composition by an identical method, you expect identical results. That the prior art references (Kojima et al and "Plasma (Ion) Nitriding") are not related to air motors is not persuasive to overcome the rejection. While they may not be directly related to air motors, they are extremely relevant to the problem addressed by the present invention, that being to solve problems associated with

abrasion of metal parts. Kojima et al and "Plasma (Ion) Nitriding" are quite pertinent to that problem.

f. One of ordinary skill in the art would not have been motivated to look back to plasma nitriding to look for guidance to change the nitrosulphurization method.

In response, despite the fact that the plasma nitrosulphurization was a step forward past plasma nitriding, one of ordinary skill in the art would have found the disclosure of "Plasma (Ion) Nitriding" reasonably pertinent because the underlying science of the two methods are the same (dissociation of nitrogen compounds which react with the steel surface), and thus, something that affects the ability of nitriding with respect to nitrogen would affect the ability of nitrosulphurizing with respect to nitrogen in the same manner.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-Th 10:00am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for all communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-1700.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw

ROY KING
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